



Figure 6.16. Schematic representation by de Duve and Wattiaux (1966) of the lysosomal system for eliminating cellular waste products. There are variations for material entering the cell from without (heterophagy) and from within (autophagy), both having three phases. On the left side, denoted *pre-lysosomes*, the incorporation of either endocytic vesicles into phagosomes or old cell parts into autophagic vesicles is illustrated. In the middle portion, these vesicles are shown as merging with primary lysosomes, generating secondary lysosomes. The crosses symbolize hydrolases. Finally, on the right side the packaging of the undigested material into residual bodies is illustrated. Reprinted, with permission, from the *Annual Review of Physiology*, 28, Figure 6, p. 468, ©1966 by Annual Reviews, [www.annualreviews.org](http://www.annualreviews.org).

and it is their contents that determine their shape, size, density and so on” (de Duve, 1963, p. 76).

Typically, the development of an understanding of how a mechanism works requires decomposing a system to determine the various component parts and their operations. In the case of the lysosome, the discovery that it was a sac containing hydrolytic enzymes made it clear how the key component part of the mechanism worked. What was required was to understand how it interacted with other components to perform the function of digesting and recycling both old cell components and material that had been brought into the cell. Developing the account of the mechanism thus required relating this